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(b) *Maximum ambient atmospheric temperature.* A maximum ambient atmospheric temperature corresponding to sea level conditions of at least 100 degrees F. must be established. The assumed temperature lapse rate is 3.6 degrees F. per thousand feet of altitude above sea level until a temperature of −69.7 degrees F. is reached, above which altitude the temperature is considered constant at −69.7 degrees F. However, for winterization installations, the applicant may select a maximum ambient atmospheric temperature corresponding to sea level conditions of less than 100 degrees F.

(c) *Correction factor (except cylinder barrels).* Unless a more rational correction applies, temperatures of engine fluids and power-plant components (except cylinder barrels) for which temperature limits are established, must be corrected by adding to them the difference between the maximum ambient atmospheric temperature and the temperature of the ambient air at the time of the first occurrence of the maximum component or fluid temperature recorded during the cooling test.

(d) *Correction factor for cylinder barrel temperatures.* Cylinder barrel temperatures must be corrected by adding to them 0.7 times the difference between the maximum ambient atmospheric temperature and the temperature of the ambient air at the time of the first occurrence of the maximum cylinder barrel temperature recorded during the cooling test.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c) of the Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964, as amended by Amdt. 27–11, 41 FR 55470, Dec. 20, 1976; Amdt. 27–14, 43 FR 2325, Jan. 16, 1978]

§ 27.1045 Cooling test procedures.

(a) *General.* For each stage of flight, the cooling tests must be conducted with the rotorcraft—

(1) In the configuration most critical for cooling; and

(2) Under the conditions most critical for cooling.

(b) *Temperature stabilization.* For the purpose of the cooling tests, a temperature is ''stabilized'' when its rate of change is less than two degrees F. per minute. The following component and engine fluid temperature stabilization rules apply:

(1) For each rotorcraft, and for each stage of flight—

(i) The temperatures must be stabilized under the conditions from which entry is made into the stage of flight being investigated; or

(ii) If the entry condition normally does not allow temperatures to stabilize, operation through the full entry condition must be conducted before entry into the stage of flight being investigated in order to allow the temperatures to attain their natural levels at the time of entry.

(2) For each helicopter during the takeoff stage of flight, the climb at takeoff power must be preceded by a period of hover during which the temperatures are stabilized.

(c) *Duration of test.* For each stage of flight the tests must be continued until—

(1) The temperatures stabilize or 5 minutes after the occurrence of the highest temperature recorded, as appropriate to the test condition;

(2) That stage of flight is completed; or

(3) An operating limitation is reached.

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964, as amended by Amdt. 27–23, 53 FR 34214, Sept. 2, 1988]

INDUCTION SYSTEM

§ 27.1091 Air induction.

(a) The air induction system for each engine must supply the air required by that engine under the operating conditions and maneuvers for which certification is requested.

(b) Each cold air induction system opening must be outside the cowling if backfire flames can emerge.

(c) If fuel can accumulate in any air induction system, that system must have drains that discharge fuel—

(1) Clear of the rotorcraft; and

(2) Out of the path of exhaust flames.

(d) For turbine engine powered rotorcraft—

(1) There must be means to prevent hazardous quantities of fuel leakage or overflow from drains, vents, or other

components of flammable fluid systems from entering the engine intake system; and

(2) The air inlet ducts must be located or protected so as to minimize the ingestion of foreign matter during takeoff, landing, and taxiing.

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964, as amended by Amdt. 27–2, 33 FR 964, Jan. 26, 1968; Amdt. 27–23, 53 FR 34214, Sept. 2, 1988]

§ 27.1093 Induction system icing protection.

(a) *Reciprocating engines.* Each reciprocating engine air induction system must have means to prevent and eliminate icing. Unless this is done by other means, it must be shown that, in air free of visible moisture at a temperature of 30 degrees F., and with the engines at 75 percent of maximum continuous power—

(1) Each rotorcraft with sea level engines using conventional venturi carburetors has a preheater that can provide a heat rise of 90 degrees F.;

(2) Each rotorcraft with sea level engines using carburetors tending to prevent icing has a sheltered alternate source of air, and that the preheat supplied to the alternate air intake is not less than that provided by the engine cooling air downstream of the cylinders;

(3) Each rotorcraft with altitude engines using conventional venturi carburetors has a preheater capable of providing a heat rise of 120 degrees F.; and

(4) Each rotorcraft with altitude engines using carburetors tending to prevent icing has a preheater that can provide a heat rise of—

(i) 100 degrees F.; or

(ii) If a fluid deicing system is used, at least 40 degrees F.

(b) *Turbine engine.* (1) It must be shown that each turbine engine and its air inlet system can operate throughout the flight power range of the engine (including idling)—

(i) Without accumulating ice on engine or inlet system components that would adversely affect engine operation or cause a serious loss of power under the icing conditions specified in appendix C of Part 29 of this chapter; and

(ii) In snow, both falling and blowing, without adverse effect on engine operation, within the limitations established for the rotorcraft.

(2) Each turbine engine must idle for 30 minutes on the ground, with the air bleed available for engine icing protection at its critical condition, without adverse effect, in an atmosphere that is at a temperature between 15° and 30 °F (between −9° and −1 °C) and has a liquid water content not less than 0.3 gram per cubic meter in the form of drops having a mean effective diameter not less than 20 microns, followed by momentary operation at takeoff power or thrust. During the 30 minutes of idle operation, the engine may be run up periodically to a moderate power or thrust setting in a manner acceptable to the Administrator.

(c) *Supercharged reciprocating engines.* For each engine having superchargers to pressurize the air before it enters the carburetor, the heat rise in the air caused by that supercharging at any altitude may be utilized in determining compliance with paragraph (a) of this section if the heat rise utilized is that which will be available, automatically, for the applicable altitude and operating condition because of supercharging.

(Secs. 313(a), 601, and 603, 72 Stat. 752, 775, 49 U.S.C. 1354(a), 1421, and 1423; sec. 6(c), 49 U.S.C. 1655(c))

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964, as amended by Amdt. 27–11, 41 FR 55470, Dec. 20, 1976; Amdt. 27–12, 42 FR 15045, Mar. 17, 1977; Amdt. 27–20, 49 FR 6849, Feb. 23, 1984; Amdt. 27–23, 53 FR 34214, Sept. 2, 1988]

EXHAUST SYSTEM

§ 27.1121 General.

For each exhaust system—

(a) There must be means for thermal expansion of manifolds and pipes;

(b) There must be means to prevent local hot spots;

(c) Exhaust gases must discharge clear of the engine air intake, fuel system components, and drains;

(d) Each exhaust system part with a surface hot enough to ignite flammable fluids or vapors must be located or shielded so that leakage from any system carrying flammable fluids or vapors will not result in a fire caused by